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ABSTRACT

Project COULD (Career Orientation Utilizing Language Development) was developed as a means of building skills, knowledges, and attitudes on elementary children's previously acquired backgrounds. Children learn to speak the grammar and vocabulary characteristic of the language heard most frequently at home and in the immediate environment. A series of units of instruction were developed from the concepts and vocabulary of the industries indigenous to Coos County (Oregon). Each unit of the instructional guide is designed to promote vocational awareness, exploration, and language development. Intended for seventh grade, the five-week unit on fishing ecology focuses on environment protection methods, fishing management vocabulary, jobs, and economic influences. It is divided into eight sections: (1) a summary; (2) a unit outline; (3) project goals; (4) unit performance objectives; (5) vocabulary; (6) suggested learning activities (games, puzzles, and evaluation and followup activities); (7) lists of resource persons and materials (audiovisual and print media) and outlines for use by the resource person (suggestions, discussion topics, and related vocabulary); and (8) background information (suggested teacher reading and job descriptions for aquatic and management biologists, marine extension agent, and experimental biological technician). (Author/BP)

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CAREER ORIENTATION UTILIZING LANGUAGE DEVELOPMENT
ED120497

PROJECT COULD

AN ESEA, TITLE III PROJECT SERVING COOS COUNTY, OREGON

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F #5
FISHING ECOLOGY
GRADE 7

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CE 006 803

PROJECT COULD

CAREER ORIENTATION UTILIZING LANGUAGE DEVELOPMENT

A PACE PROJECT

Elementary and Secondary Education Act of 1965

Project COULD was developed as a means of building skills, knowledges, and attitudes upon elementary children's previously acquired backgrounds. Children learn to speak the grammar and vocabulary characteristic of the language heard most frequently at home and in the immediate environment.

A series of units of instruction were developed from the concepts and vocabulary of the industries indigenous to Coos County. The intention was to promote vocational awareness, exploration, and language development for the students in grades 3 to 8.

The information in this unit was prepared for use at the seventh grade level for an approximate period of five weeks.

Materials prepared by Project COULD are available from the IMC of Coos County Intermediate Education District, 2405 Colorado Street, North Bend, Oregon 97459.

SCHEDULE OF UNITS

Grade Level	Fishing
Grade 3 Unit F #1	Harvesting Fish
Grade 4 Unit F #2	Harvesting Shellfish
Grade 5 Unit F #3	Seafood Processing
Grade 6 Unit F #4	Marketing Fish
Grade 7 Unit F #5	Fishing Ecology
Grade 8 Unit F #6	Coos County Careers in Fishing

This instructional guide is divided into eight sections. Each section is tabulated for easier use and quick reference.

Summary:

The intentions and reasoning for this program have been stated. For effective results, it is suggested that the teacher become totally familiar with the curriculum guide before beginning.

Outline:

This section gives an overall view of all of the sequenced units. Details of the information to be covered in this unit are specifically outlined.

Goals:

Objectives:

Activities:

These three sections are sequentially integrated to clearly define what activities are suggested for a particular objective and a particular goal. Each goal is numbered to correlate directly with objectives, activities and resources.

Vocabulary:

All terminology found in the unit, including particular occupations, is included in this section. Each term is defined. These definitions are intended for teacher use only.

Resources:

Locally produced material, Coos County resource people, books, pamphlets and commercially prepared media are listed with reference made to activity correlation.

Background:

This section contains additional material for teacher use.

ECOLOGY
UNIT F #5 OVERVIEW

The following outline represents the scope of the entire set of units (grades 3-8) for the category of FISHING. Only the outline for this unit is in its completed form.

SUGGESTED TIME: FIVE WEEKS
Methods of Fishery Environment Protection: 10 days
Fishery Management Vocabulary: 14 days
Jobs in Fishery Environment Protection: 10 days
Economic Influences: 4 days

(UNIT F #1) HARVESTING FISH

(UNIT F #2) HARVESTING SHELLFISH

(UNIT F #3) SEAFOOD PROCESSING

(UNIT F #4) MARKETING

(UNIT F #5) ECOLOGY

A. Methods of fishery environment protection
   1. What would you do?
   2. Shrimp and groundfish investigation
   3. Coastal rivers research
   4. Estuary management
   5. Marine extension work
B. Fishery management vocabulary
   (see vocabulary section of this unit)
C. Full and part time jobs in protecting the fishery environment
   1. Aquatic biologist
   2. Management biologist
   3. Experimental biological technician
   4. Marine extension agent
D. Economic influences of the workers on the fishing industry of Coos County.

(UNIT F #6) COOS COUNTY CAREERS

OUTLINE

GOALS

1. To make the students aware of the various methods used to protect the environment in the commercial fishing industry of Coos County.

2. To make the students aware that people working to protect the fishing environment in Coos County use a unique set of terms to facilitate communication.

3. To make the students aware that protecting the fishing environment in Coos County offers various opportunities for employment on a seasonal and full time basis.

4. To make the students aware that protecting the environment of our commercial fisheries will insure an optimum yield of seafood for years to come.

The intention of Project COULD units is to utilize the language arts areas of reading, writing, listening, and speaking, as the vehicles to promote vocational awareness and exploration. It is not to dictate language arts curriculum, but to suggest that the vocational areas under consideration do have unique languages and concepts.

It is assumed that the language development aspect of the activities will be commensurate with the on-going language arts programs of the students participating in the various units prepared by COULD.

PERFORMANCE OBJECTIVES

1. Given their choice of the occupational areas of: (1) groundfish and shrimp investigation, (2) coastal rivers research, (3) estuary management, (4) marine extension agent, the learners will:
   a. Select the method of fishery environmental protection
   b. Research the methods used by each worker in that area to help protect the fishery environment
   c. Participate in an oral report explaining these methods

2. Given their choice of any ten (10) words from the VOCABULARY section of this unit, the learners will write a definition for each without the aid of references.

3. Given the COULD prepared occupational description sheets, the learners will write in the following information for each worker in his selected occupation area:
   occupational description
   equipment
   minimum qualifications
   wages
   working hours
   possible promotions

4. Given the COULD prepared worksheet entitled, Catch As Much of Anything As You Like, the learners will list how a restriction-free fishery would affect each of the workers listed on the worksheet.

OBJECTIVES

THE DEFINITIONS PROVIDED ARE INTENDED FOR TEACHER USE. IT IS SUGGESTED THAT THE STUDENTS FORMULATE THEIR OWN DEFINITIONS THROUGH THE ACTIVITIES OF THIS UNIT.

VOCABULARY AND SPELLING

In this unit, 35 vocabulary words and 4 key occupations are discussed. These words and occupations can and should be used as a part of the spelling program in the classroom. You, as the teacher, are the best judge as to how this should be done in your classroom. No matter how you approach the matter, remember that it is just as important to know how to spell the word as it is to know how to use it correctly in speaking.

MASTER VOCABULARY LIST

A permanent listing of all current vocabulary words should be available to the students at all times during the study of fishing. Having this list of words and their definitions readily available to the children on charts, the overhead projector, the blackboard or a vocabulary notebook will provide the children with an immediate reference should the need arise. A professional in-depth type of definition will not be nearly as valuable to the children as one that they have written, discussed and put on the master list themselves. If a definition is to be useful, it must be easily understood by the children.

VOCABULARY

BIO MASS	This is the term given to the number of pounds of living fish estimated to live in the fishery. This information can be used to determine trends* in fish population in the area.
BOD OR BIOLOGICAL OXYGEN DEMAND	A test made to determine the amount of oxygen that is absorbed by the living organisms within the water.
BUFFER STRIP	In this unit, the meaning refers to a strip of trees and other vegetation left standing on either side of a stream flowing through a logged off area. This vegetation prevents erosion of soil which could make the water unfit for fish life.
COHO	A species of salmon more commonly known as silver salmon.
COMPETITION	In this unit, the word refers to the efforts of two or more species* of fish to obtain food and shelter from the same body of water.
DISCRETE POPULATION	A population of fish made up almost entirely of one species*.
DISSEMINATION	To pass along information to other persons.
DORSAL FIN	The vertical fin on the back (dorsal side) of the fish.
ECOLOGY	The relationships of all organisms to their environment*, and to each other.
ENVIRONMENT	Everything making up the surroundings in which we live.
ESTUARIES	The areas where the tide meets a river current. These areas are many times very productive food sources for the fish life in the area.
FISHERY	May refer to the seafood processing plant or the act of fishing for a certain type of fish in a particular area.
FISHERY RESOURCE SUPPLY	A special survey made of the fishery* by sampling the biomass*of different random areas. A research vessel fishes for brief periods of time in about 100 sample areas of the fishery*. The fish caught are sampled by a process similar to that used in market sampling* and thrown back into the water. From the statistics that are gathered, it is possible to estimate the biomass* of the fishery* off the coast.

*Defined within the vocabulary section.

GILL NET	A type of net used to catch fish. The fish swims into the net and is entrapped in the mesh. The net is called a gill net because if the fish tries to back out, his gills become caught on the strands of the net. The net is usually suspended from a cork line and hangs down in the water, held in this vertical position by lead weights.
LAKE TRAPS	Any of various fish traps that are set up in coastal lakes to trap live fish. Usually composed of umbrella shaped wings leading to a heart section of the net and finally into the trap itself.
LAND FILL	Any area that is filled up with dirt or some form of earth, such as a small estuary* that has been filled with soil for the purpose of building a structure.
LANDING RESTRICTIONS	Restrictions placed on the amount or size of fish that can be caught and kept for sale to the fishery*. Imposed because of a decrease in the number of a certain species* of fish in a certain area.
LIMNOLOGY	The study of bodies of fresh water.
LOG INFORMATION	Data kept in the log book of a commercial fishing boat. The information tells the location of the fishing done, the depth at which the fishing was done and the amount of fish caught in that area.
MARKET SAMPLING	When the boat brings a load of fish to the fishery*, the aquatic biologist* will remove about 200 fish from the catch. He will separate them into different piles according to species*. He counts and records the number of each species*. He may also sort one of these piles into smaller piles according to sex or age and weigh the fish individually, then record the information. From these figures he can estimate the approximate weight of each species that makes up the catch and the different species in the catch.
MIGRATION	In this unit the word refers to the movement of fish to and from various bodies of water or locations within the body of water.
OVERFISH OR FISH OUT	To land so many fish from an area that there are very few fish left.

*Defined within vocabulary section.

RANDOM SAMPLE	Part of a fish population is selected for study to gain information about the whole. There is no definite method used for this sampling.
RECORD SHEETS	The sheets on which research statistics are recorded.
SCALES SAMPLE	A few scales are removed from the fish and examined. From this examination can be determined the age of the fish.
SEINE	A net with lead weights on one edge and floats on the other edge; used (vertically) to encircle fish when the ends are brought together or drawn ashore.
SEINING	To fish with a seine*, a particular type of net (see seine*)
SHRIMP GROUND SURVEY	A special survey made of the shrimp fishery*. Short tows are made in the known shrimp grounds and the shrimp are sampled for weight, sex, and age. This information is recorded on charts. Over a period of years, different trends* in the shrimp population, size, sex, and growth can be determined. The survey is made in September.
SPAWN	In this unit the word is used to refer to the reproductive act of fish in producing, depositing, and fertilizing their eggs in portions of coastal lakes and streams called spawning grounds*.
SPAWNING GROUNDS	The area of coastal lakes and streams where fish spawn* from year to year.
SPECIES	Fish belonging to a biological group with similar characteristics.
TAG	Any of various types of fish tags which can be attached to the fish. The tags have on them the address, name of the Oregon Fish Commission, and a number.
TRENDS	Over a period of time the quantity of a species* of fish, the number of males and females, the size and weight of the fish will vary. With the records kept, certain likenesses ("trends") will appear as a decrease or increase in the quantity of fish, size, or the number of males and females.
TRIBUTARIES	The smaller streams that feed into larger rivers and/or lakes.

*Defined within vocabulary section.

KEY OCCUPATIONS

AQUATIC BIOLOGIST	This worker does research of various types including market sampling*, resource surveys, shrimp ground surveys*, fish tagging*, coastal river research, estuary* management, and land use planning to determine the best ways to obtain an optimum yield from our fisheries.
EXPERIMENTAL BIOLOGICAL TECHNICIAN	This man is assigned the duty of helping other workers at the Oregon Fish Commission Field Lab. He will record information collected during the different research studies being made. He also helps prepare and repair any equipment to be used during the research.
MANAGEMENT BIOLOGIST	This worker does research into probable environmental impact on estuaries*, rivers, streams, and lakes in the county before construction permits may be granted. He may also be involved in shad and striped bass research aimed at determining the best way to provide the optimum yield from that fishery*.
MARINE EXTENSION AGENT	This worker is responsible for keeping the fishermen and other interested people in the county informed on proposed regulations on the fishing industry, environmental* problems which arise, and how these problems will affect the people living in the county. He will propose possible solutions to the environmental* problems and help people organize their thoughts and channel them to the proper decision making groups of the state and federal governments. He tries to get different groups to do environmental* studies in this area.

*Defined within vocabulary section.

RESOURCE PEOPLE LISTED IN THE RESOURCE SECTION OF THIS UNIT SHOULD BE CONTACTED AT LEAST ONE WEEK IN ADVANCE OF THEIR VISIT. THEY SHOULD HAVE AVAILABLE AN OUTLINE OF THE MATERIAL YOU WISH COVERED AND A LIST OF ANY EQUIPMENT YOU WOULD LIKE THEM TO BRING. (IF ONE OF THE CHILDREN'S FATHERS COULD BE USED AS A RESOURCE PERSON, THIS MAY BE BENEFICIAL TO THAT STUDENT AND THE CLASS AS A WHOLE).

THE TEACHER WILL NEED TO BRING THE FOLLOWING EQUIPMENT FOR USE IN THE UNIT:

SEVERAL PACKAGES OF 5 x 8 INCH INDEX CARDS.

TWO DIFFERENT COLORED FELT TIP PENS.

SEVERAL SHEETS OF TAGBOARD.

Week	Monday	Tuesday	Wednesday	Thursday	Friday
1st Week	1-A 1-B 1-C 1-D 1-E	1-E	1-F 1-I 1-G 1-H 2-A 2-B 3-A 3-C	1-I 1-G 1-H 2-A 2-B 3-A 1-L 1-M Alt.	1-L or 1-J 1-K 2-C 3-B
2nd Week	1-L 1-M 2-D	1-L 1-M	1-L 1-M or 1-N 1-O 1-P	1-L or 1-M 2-F	1-L 1-M or 2-B 3-A 1-M Alt. 1-Q 1-R 1-S 2-C 3-B
3rd Week	1-AA 2-H 2-D or 2-E	1-AA 2-H or 2-B 3-A 1-M Alt. 1-T 1-U 2-C 3-B	1-AA 2-H or 2-G	1-BB 2-H 3-E or 2-B 3-A 1-M Alt. 1-V 1-W 1-X 2-C 3-B	1-BB 2-H 3-E or 2-F
4th Week	1-BB 2-H 3-E or 1-Y	1-BB 2-H 3-E or 1-Y	1-CC or 1-Z	1-CC 1-Z	1-Z 1-DD (Test for Obj. 1)
5th Week	3-D 3-F (Test for Obj 3.)	4-A 4-B 4-C 4-D	4-D 2-D 2-E 2-F	4-E 2-I. 2-J (Test for Obj 2.)	4-F 4-G (Test for Obj 4.)

1-A Begin this unit by writing the word "environment" on the chalkboard or overhead projector. Accept volunteers to define this word. (Allow the use of reference books if necessary.) Ask questions such as the following to help the students begin thinking about what things make up the environment:

What things can you think of that make up our environment here at school? At home? Out of doors?
What is a commercial fisherman?
What things would make up his environment? List.

1-B Tell the class that you have an audio tape interview which will explain some of the environmental problems which affect both them and the commercial fishermen. Instruct the class to listen to the COULD prepared audio tape entitled What Would You Do?, and list the environmental problems.
ALTERNATE ACTIVITY: Arrange for a resource speaker or speakers from the list of speakers in the RESOURCE section of this unit. Instruct the class to take notes listing the environmental problems mentioned by the speaker.

1-C Listen to the COULD prepared audio tape entitled What Would You Do? or to the resource speaker, such as the county marine extension agent.

1-D FOLLOW UP: Accept volunteers from the class to list the environmental problems and their causes. List these on the chalkboard or overhead projector.

1-E Accept volunteers or appoint students to work in one of the following three problem solving groups:
Foreign Fishing Fleets
Too Many Fishermen
12 Mile Limit
Appoint an area for each group to work in. Instruct the students to try to work out a sensible solution to the problem they have heard presented. Allow an appropriate amount of time for this discussion and move from group to group asking questions which will help the children think of loop holes in their proposed solutions.

1-F FOLLOW UP: Allow each group to present their proposed solutions to the class. Allow the other students in the audience to make comments as to the feasibility of the proposed solutions and ask questions.

1-G The teacher may wish to instruct the children to make notebooks during their study of fishery environmental protection. The notebooks could include such things as any reports, notes, vocabulary words, definitions, any pictures the children may have drawn or cut from magazines and anything else the teacher or students wish to include. These notebooks could be displayed at the end of the unit for another class, PTA, or Open House.

1-H ENRICHMENT ACTIVITY: Discussion of Research: Before the children begin their research, it would prove valuable to discuss with them any research technique you wish them to learn. Also at this point, the librarian could present some lessons on use of the card file and any resource books in the library.

1-I Inform the students that there are people in our county working to solve these problems as well as many others dealing with the fishery environment. Each worker uses different methods in his work. Suggest that the students do some research into the methods on the chalkboard or overhead projector and accept volunteers to research each method:

Shrimp and Groundfish Investigation
Coastal Rivers Research
Estuary Management
Marine Extension Work

Assign each group of students a place to work within the classroom. Hand each group a list of available media or assemble the media for use in their work area. Instruct the groups to define the key occupations and vocabulary that deals with their area of research. Then skip to Activity 1-L.

ALTERNATIVE ACTIVITY: (Correlates with Activities 2-B, 3-A, and 1-L Alternate Enrichment Activity.) If the teacher feels a total class study of each method of fishery environmental protection would be more of a benefit to his class at this time, follow the sequential order of the following activities, omitting Activity 1-L and those days allowed for research activities, reports, etc.).

Inform the students that there are people in our county working to solve these problems as well as many others dealing with the fishery environment. Each worker uses different methods in his work. Suggest that the students do some research into the methods used to protect the fishery environment by viewing or listening to the COULD prepared media listed below:

16mm film: Protecting Aquatic Life: The Environmental Biologist.
Pamphlets: Oregon Fish Commission: Shrimp and Groundfish Investigation
More Jobs of the Aquatic Biologist
The Work of the Marine Extension Agent
Audio Tape: What Would You Do?

Select from the following procedures the one you feel will work best with your students:

a. Instruct the students to take notes describing groundfish market sampling, log research, the resource survey, the shrimp ground survey, and tagging fish.

b. List the following research methods on the board and appoint students or accept volunteers to take notes on the particular process involved:

Groundfish Market Sampling
Log Research
Resource Ground Survey
Shrimp Ground Survey
Tagging Fish

Vocabulary and key occupations to define from the media presentation;

random sample	overfish
market sampling	landing restriction
species	log information
trend	fish tag
discrete population	record sheet
biomass	scale sample
fishery	aquatic biologist
experimental biological technician	

ALTERNATE ACTIVITY: Suggest to the class that they do some research on the methods used to protect the fishery environment. Read the COULD prepared pamphlet, Oregon Fish Commission: Shrimp and Groundfish Investigation, and select from the procedures listed below the one you feel will work best with your students:

a. Assign the pamphlet as silent reading for the class. Assign or accept volunteers to take notes and define the underlined vocabulary words for one of the processes.
b. Accept volunteers to read selections from the pamphlet orally while the rest of the class reads along silently. As the steps in the processes are read, place them on a chart, chalkboard or overhead projector step by step, and define the underlined vocabulary words on the chalkboard, overhead projector or master list.
c. Assign or accept volunteers for five oral reading groups. Instruct these groups to share the oral reading, take notes on this step by step process, and define the underlined vocabulary words.

1-J View and/or listen to the selected media listed below:

16mm film: Protecting Aquatic Life: The Environmental Biologist.
Pamphlets: Oregon Fish Commission: Shrimp and Groundfish Investigation
More Jobs of the Aquatic Biologist
The Work of the Marine Extension Agent
Audio Tape: What Would You Do?

1-K ALTERNATE ACTIVITIES FOLLOW UP: (Correlates with Activities 2-C and 3-B.) Accept volunteers from the class or groups to list the methods used and the steps in each. List these methods used and the steps on the chalkboard or overhead projector or on pieces of chart paper. Mount the charts on a bulletin board for future reference.

1-L GROUP RESEARCH: Some sort of schedule will have to be set up for audio visual equipment use which provides equal time for each of the four groups. If you wish to have a resource speaker talk with the groups, contact the people listed in the RESOURCE section under the various headings. Be sure to send the resource outline well in advance of the visit so the speaker will have ample time to prepare. Then skip to Activity 1-EE.

1-M ENRICHMENT ACTIVITY: Invite a resource speaker to visit your class and discuss his job with the students. Lead up to this activity with a class discussion about what the students would like to know about this worker and his job. Compile a list of questions they would like to ask the visitor. Follow up the visit by briefly reviewing the job, technical vocabulary and any equipment.

ALTERNATE ENRICHMENT ACTIVITY: The resource speaker could be invited to view the media presentation with the class and participate in the follow up activities (1-I, 2-C, and 3-B).

1-N Write the word "ecology" on the chalkboard or overhead projector and accept volunteers to define the word. Ask the class how the marine life living in a lake would form a part of the ecology of the lake. Suggest that the students view the film entitled Still Waters and instruct them to be ready to discuss what they see.

1-O Show the 16mm film entitled Still Waters.

1-P FOLLOW UP: Ask the students questions such as the following to help them conclude that any break in an eco-system effects all other portions of the ecology:

What animal life did you see in the film? List.
What did these animals eat?
What changes might come about if all the fish were caught by the fishermen? List.
How would this effect the frog population? The turtle population? List.
What might happen if all of the frogs suddenly disappeared from the pond?

1-Q (Correlates with Activities 2-B, 3-A, 1-L and 1-M) Suggest that the students view the selected COULD prepared media listed below to learn about other methods used to protect the fishery environment:

16mm Film: Protecting Aquatic Life: The Environmental Biologist.
Pamphlet: Protecting Our Valuable Estuaries.

Select from the following procedures the one you feel will work best with your students:

a. Instruct the students to take notes on the research methods used by the Management Biologist.
b. List the research methods on the chalkboard or overhead projector and appoint students or accept volunteers to take notes on the particular process involved:
   Estuary Management
   Shad and Striped Bass Research

Vocabulary and key occupations to define from the media presentation:

scale sample	gill net
fish tag	buffer strip
estuary	record sheet
spawn	dorsal fin
spawning ground	migration
seine	management biologist
seining	

ALTERNATE ACTIVITY: Suggest to the class that they do some research on the methods used to protect our estuaries. Hand out a copy of the COULD prepared pamphlet entitled Protecting Our Valuable Estuaries to each

student and select from the procedures listed below the one you feel will work best with your students:

a. Assign the pamphlet as silent reading for the class. Assign or accept volunteers to take notes and define the underlined vocabulary words for one of the processes.

b. Accept volunteers to read selections from the pamphlet orally while the rest of the class reads along silently. As the steps in the processes are read, place them on a chart, chalkboard, or the overhead projector or master list.

1-R View and/or listed to the selected media listed below:

16mm Film: Protecting Aquatic Life: The Environmental Biologist.

Pamphlets: Oregon Fish Commission: Shrimp and Groundfish Investigation.
More Jobs of the Aquatic Biologist.
The Work of the Marine Extension Agent.
Protecting Our Valuable Estuaries.

1-S FOLLOW UP: (Correlates with Activities 2-C, 3-B, and 1-Alternate Enrichment Activity.) Accept volunteers from the class or groups to list the steps in each research method used in fishery environment protection by the management biologist. List the steps on the chalkboard or overhead projector or on pieces of chart paper. Mount the charts on a bulletin board for future reference.

1-T Suggest to the class that they view selected media listed below to learn about methods used by the aquatic biologist to protect the fishery environment:

16mm Film: Protecting Aquatic Life: The Environmental Biologist.

Pamphlet: More Jobs of the Aquatic Biologist.

Select from the following procedures the one you feel will work best with your students:

a. Instruct the students to take notes on the research methods used by the aquatic biologist.

b. List the following research methods on the chalkboard or overhead projector, and appoint students or accept volunteers to take notes on the particular process involved:

gill netting
lake trapping
spawning count

Vocabulary words and key occupations to define from the media presentation:

gill net
lake trap
spawning count
fishery
species
limnology
scale sample
coho
record sheets
competition
spawning grounds
spawn
B.O.D. or biological oxygen demand.
aquatic biologist
tributaries
experimental biological technician

ALTERNATE ACTIVITY: Suggest to the class that they do some research on some other methods used to protect the fishery environment. Hand out a copy of the COULD prepared pamphlet More Jobs of the Aquatic Biologist and select from the procedures listed below the one you wish to use with your class:

a. Assign the pamphlet as silent reading for the class. Assign or accept volunteers to take notes and define the underlined vocabulary words for one of the processes.
b. Accept volunteers to read selections from the pamphlet orally while the rest of the class reads along silently. As the steps in the processes are read, place them on a chart, chalkboard, or overhead projector step by step and define the underlined vocabulary words on the chalkboard, overhead projector, or master list.
c. Assign or accept volunteers for three oral reading groups. In struct these groups to share the oral reading, take notes on this step by step process, and define the underlined vocabulary words. Then skip to Activity 1-U.

1-U FOLLOW UP: (Correlates with Activities ?-C, 3-B, and 1-M Alternate Enrichment Activity.) Accept volunteers from the class or groups to list the steps in each research method used in fishery environmental protection by the aquatic biologist. List the steps on the chalkboard, overhead projector, or on pieces of chart paper. Mount the charts on a bulletin board for future reference.

1-V Ask questions such as the following to help the students begin thinking about how all the statistics gathered by the Oregon Fish Commission finally get to the local fishermen:

If all of the statistics gathered by the Oregon Fish Commission are put into reports and record files, how do you think the fishermen learn what is in these statistics?

Since these reports are written by scientists (biologists) they are probably in scientific terms. If the fishermen read the reports, will they be able to understand them?

Do you think the commercial fishermen have any way of helping to decide whether restrictions should be placed on the fishery or not? Explain.

Suggest that the class view the selected media listed below to learn more about a worker whose job is partly helping to keep the fishermen informed:

16mm Film: Protecting Aquatic Life: The Environmental Biologist.

Instruct the students to take notes on the methods used by the Marine Extension Agent to help the fishermen play a part in fishery environmental protection.

Vocabulary and key occupations to be defined from the media presentations:

Dissemination
Land fill
Marine Extension Agent

ALTERNATE ACTIVITY: Suggest to the class that they do some research on the methods used to protect the fishery environment. Hand out a copy of the COULD prepared pamphlet entitled The Work of the Marine Extension Agent to each student and select from the procedures listed below the one you feel will work best with your students:

a. Assign the pamphlet as silent reading for the class. Assign or

accept volunteers to take notes and define the underlined vocabulary words for one of the processes.

b. Accept volunteers to read selections from the pamphlet orally while the rest of the class reads along silently. As the steps in the processes are read, place them on a chart, chalkboard, or overhead projector step by step and define the underlined vocabulary words on the chalkboard, overhead projector, or master list.

1-W Read the selected media below:
Pamphlet: The Work of the Marine Extension Agent.

1-X FOLLOW UP: (Correlates with Activities 2-C, 3-B, and 1-M Alternate Enrichment Activity.) Accept volunteers from the class or groups to list the steps in each research method used in fishery environmental protection by the Marine Extension Agent. List the steps on the chalkboard, overhead projector, or on pieces of chart paper. Mount the charts on a bulletin board for future reference.

1-Y Suggest to the class that they break up into the following four groups:
Shrimp and groundfish investigation
Estuary management
Marine extension agent
Coastal rivers research
Allow the students to select the group they wish to work on. Instruct the groups to use their notes, vocabulary lists, and occupational description sheets for their background. Have the students write out a script to be used in an oral type report. Tell the groups to make their scripts well organized and in a form as might be used on the radio. Instruct the groups to divide the writing and reading of the report equally among the members.

1-Z FOLLOW UP: Allow each group to read their script (report) into the tape recorder. This may be done in front of the whole class or as a spare time activity. The tape may be played at open House, PTA meetings, or for another class. Then skip to activity 1-CC.

1-AA GROUP PLANNING SESSION: Instruct the members of each of the four groups to plan together how they will present their research information to the rest of the class in an oral report. Remind the groups that each student is to have some part in these reports.

1-BB GROUP REPORTS: Allow each group to report orally to the class. Allow the class members to ask questions after each report and give them enough time to take notes, copy vocabulary definitions, and fill out occupational description sheets. A tape recorder or video tape could be utilized to record these reports for playback to PTA, another class, or at Open House.

1-CC ENRICHMENT ACTIVITY: Some of the students may enjoy writing up an article for the school or local newspaper telling what the class has been studying.

1-DD Evaluation Activity: (Test for Goal and Objective 1)
Given their choice of the occupational areas of (1) groundfish and shrimp investigation, (2) coastal rivers research, (3) estuary management, (4) marine extension agent, the learners will:

a. Select method of fishery environmental protection.
b. Research the methods used by each worker in that area to help protect the fishery environment.
c. Participate in an oral report explaining these methods.

2-A Hand out a ditto copy of the vocabulary words and key occupations titles as found in the VOCABULARY section of this unit. Instruct the children to define the words and describe the occupations as they come across them in their study of this unit.

2-B Select from the following procedures those which you feel will work best with your class:

a. List the vocabulary on the chalkboard. When the students volunteer to take notes on the different research methods, instruct them to define the words which pertain to their research method.
b. Divide the vocabulary to be defined into small groups of words. Allow the students to volunteer or appoint children to define words in the different groups.
c. List the vocabulary to be defined on the chalkboard. Instruct the children to define these words.
d. List the vocabulary to be defined on the chalkboard. Instruct the students to be aware of the words and be ready to tell their meaning after the presentation.

2-C FOLLOW UP: Accept volunteers from the class or groups to define the vocabulary words. Write the words and their definitions on the chalkboard or overhead projector, and later appoint students to transfer the words to the Master Vocabulary List or do this yourself. Allow the class time to fill in these definitions on their vocabulary sheets.

2-D ENRICHMENT ACTIVITY: GAME: COLLEGE BOWL

Teacher Preparation----Make two different colored sets of all vocabulary words to be defined on 5"x 8" cards, one word to a card.

Objectives----------To see which team, at the end of the game, has the most points.

Procedures----------Divide the class into two teams. Hand out the word cards, one color for each team, one card at a time to each student until all cards are gone. Give the definition orally to the class. If a student has the card with the correct word on it, he may answer the question. If he thinks he has the right card, he may also try.

Rules----------To be able to answer, the student must stand up and say "CALL!" In this way the teacher sees and/or hears the first person to stand on each team. If the answer given by the first person to stand and say "CALL!" is correct, his team gets the point. If he misses the question, the first person who called on the other team gets a chance to answer. If he is correct, his team gets a point. If both players give incorrect answers, the definition is given again later on in the game.

2-E ENRICHMENT ACTIVITY: GAME: WORD DOWN

Teacher Preparation----None.

Objectives----------The object of this game is to see which team, at the end of the game, has the most members still standing.

Procedures----------Divide the class into two equal teams. Each team stands in a line facing the other on opposite sides of the room. A word or definition is given orally by the teacher to the student at the head of the line of first one team and then the other. If the correct answer is given, a word or definition is given to the first person in line on the other team. The next set of questions would be given to the second person in each line and so on until the end of the line is reached. At this time, the process begins all over.

Rules----------If the player being questioned gives a correct response, he continues to stand. If his answer is incorrect he must sit down. If neither player gives the correct response, both must sit down and someone already sitting is given a chance to answer. If he is correct, he rejoins his team at the end of the line.

2-F ENRICHMENT ACTIVITY: GAME: ARRANGEMENT

Teacher Preparation----The teacher should make up cards or strips of tagboard with the vocabulary word or key occupation on one and the definition on the other.

Objectives----------For the player to arrange the people holding the vocabulary word cards so they are standing under the correct definition card. The winning player gets a point for his team.

Procedures----------The students select teams or the teacher can appoint them. The teacher then tapes three or more definition cards to the board for each team A and B. Holders from team A are given the corresponding word cards and allowed to stand under the definitions for team B and vice versa, making sure they are mixed up. An arranger is then selected from each team. He/she goes to the board and at the "GO" signal, moves the holders under the correct definitions. The first arranger to arrange the holders under the correct definitions wins a point for his team. When he/she is finished, he must say "CALL!"

Rules----------The holders trying to stump the arrangers from the other team may stand under any definition, even the correct one if they choose. Arrangers must not begin until the "GO!" signal is given. When an arranger says "CALL!" he must not do any further arranging. If he is wrong, wait for the other arranger to finish. If both are wrong, select two new arrangers, more holders and place new definitions on the board. A

variation would be to select new arrangers as soon as it is determined that an arrangement is wrong and in this manner, keep the game moving until the correct arrangement is obtained. This would require the students to know who was to be the next arranger before the "GO!" signal was given. One point is given for a correct arrangement of all words and definitions. (NOTE: Set a time limit for arranging if you feel it necessary.)

2-G ENRICHMENT ACTIVITY: Some of the children might like to play around with either writing the words from the vocabulary in letter styles that suggest the meaning of the word or making up a cartoon using their word. On the following pages are samples of each. Encourage the children to use their imagination when doing this activity and allow two or more students to work together if they wish.

2-H Before the group reports on fishery environmental protection, instruct the students in the groups to define any words that they will be using by utilizing one of the procedures listed below:

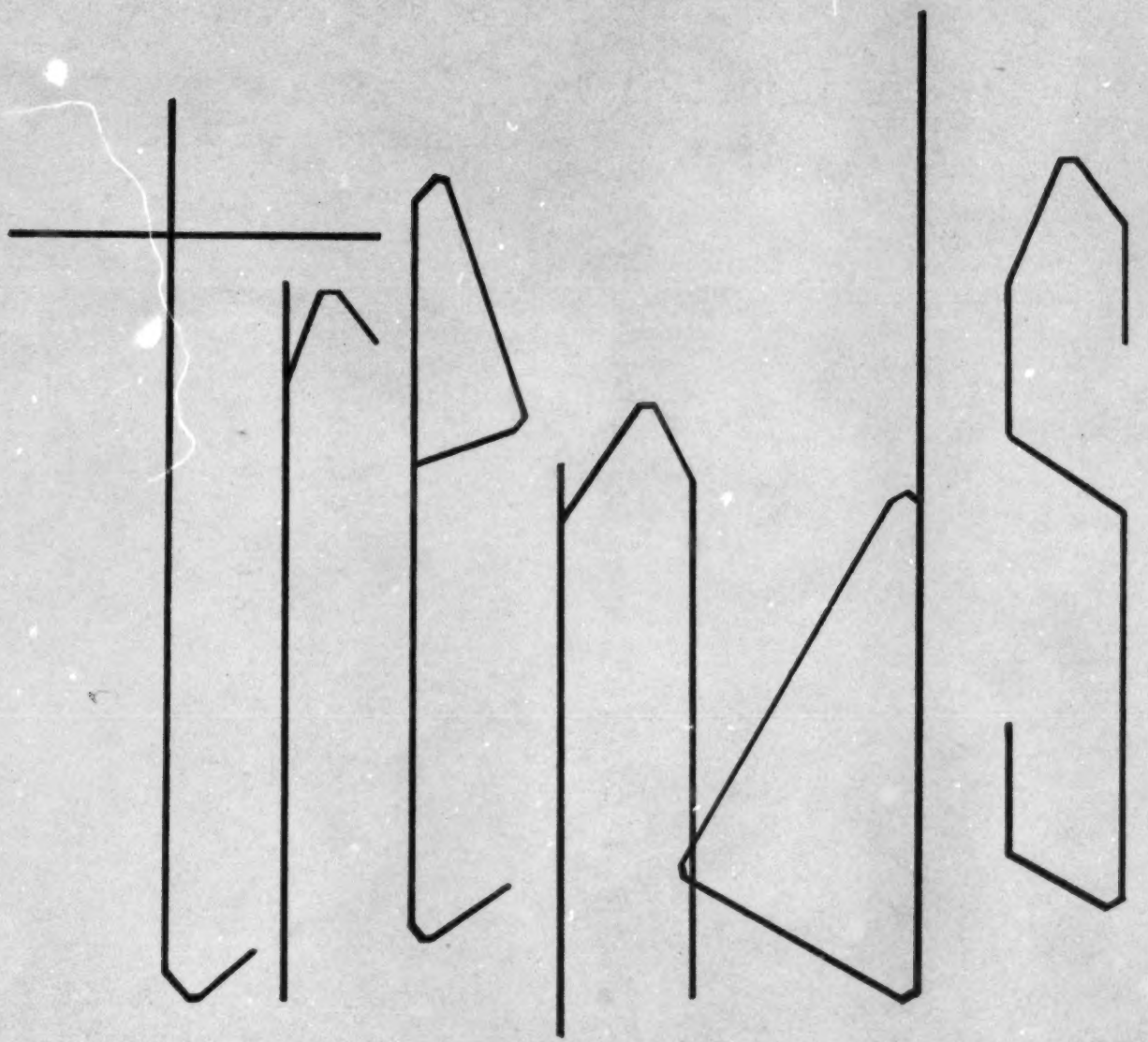
a. Have the children in the group list the words they will be defining on the chalkboard or overhead projector. As the words are defined during the discussion, their definitions can be written in.
b. Have the panel members write the vocabulary words and their definitions on the chalkboard or overhead projector. They can then refer to them during the discussion.
c. Have the panel members make up a ditto master so that ditto copies can be run off in advance so that each member of the class will have a copy.

Depending upon the method used, allow time for the other class members to copy the definitions onto the vocabulary lists given them in Activities 2-A, or add the words to the Master Vocabulary List.

2-I Hand the children a copy of the vocabulary list from Activity 2-A or place the vocabulary words on the chalkboard or overhead projector. Instruct the children to select at least ten words from the list and write a definition or job description for each. Do not allow the use of notes or any resource materials.

2-J EVALUATION ACTIVITY (Test for Goal and Objective 2):
Given their choice of any ten (10) words from the VOCABULARY section of this unit, the learners will write a definition for each without the aid of references.

LANDING
RESTRICTION
SM



3-A Before each media presentation, select the procedures from those listed below you feel will work best with your class:

a. Instruct the students to list the occupation titles they see in the media presentation and a brief description of each.

b. Instruct the students to be aware of the different workers in the media and be ready to discuss their jobs.

3-B FOLLOW UP: List each occupation title on the chalkboard, overhead projector, or on a sheet of chart paper. Accept volunteers from the class to write or tell about that worker's job. When the chart is completed, post it on a bulletin board for future reference.

3-C Hand the children a copy of the COULD prepared Occupational Description Sheet and place the remaining supply in a place easily accessible to the students. Instruct the students to fill in the required information for each worker as they progress with their study of this portion of the fishing industry. These can be collected at the end of the unit, added to the notebook suggested in Activity 1-G, or used as suggested in the following activities.

3-D FOLLOW UP: Accept volunteers from the class or groups to fill in the COULD prepared overhead transparency entitled Occupational Description Sheet for each occupation discussed.

3-E ENRICHMENT ACTIVITY: As the children make their presentations of the methods of protecting the environment of the fishery, they should also present the occupational description sheets. Instruct individuals or each group to use the COULD prepared overhead transparency entitled Occupational Description Sheet for each occupation discussed.

3-F EVALUATION ACTIVITY: (Test for Goal and Objective 3)Given the COULD prepared occupational description sheets, the learners will write in the following information for each worker in his selected occupation area:

occupational description
equipment
minimum qualifications
wages
working hours
possible promotions

OCCUPATIONAL DESCRIPTION SHEET

_____
(Worker's Title)

OCCUPATIONAL DESCRIPTION:

EQUIPMENT:

MINIMUM QUALIFICATIONS:

WAGES:

WORKING HOURS:

POSSIBLE PROMOTIONS:

4-A Suggest that the class view the COULD prepared media listed below:
16mm Film: Coos County Fisheries: An Overview.
Instruct the students to list all the occupation titles of the workers they see in the film.

4-B FOLLOW UP: Accept volunteers from the class to list the occupation titles as seen in the media presentation. List these on the chalkboard, or overhead projector.

4-C ENRICHMENT ACTIVITY: Ask for volunteers to place the occupation titles in groups of "occupations that go together". As the groupings are made, encourage the students to explain why they feel these occupations go together. Allow discussions among the class members if there is some disagreement. One occupation title may be placed in several areas if a decision cannot be reached. Then accept volunteers to give each group a title. NOTE: An easy way to do this grouping and labeling is on a large sheet of butcher paper. As titles are grouped, those on the chalkboard or overhead projector can be erased or crossed out.

4-D Hand each student a copy of the worksheet entitled Catch As Much of Anything As You Like. Select a student to read the directions orally as the class reads silently or assign the sheet as individual class or homework. (See the worksheets on the following pages.)

4-E FOLLOW UP: Accept volunteers to describe what effect a restriction-free fishing industry would have on each of the workers listed and how this would effect the economy of the county.

4-F ENRICHMENT ACTIVITY: This activity may be used to help the students summarize the unit. It is intended only as an enrichment activity. Place the following key occupations on the chalkboard, overhead projector, or ask the students to list the key occupations in this unit: Aquatic Biologist, Management Biologist, Marine Extension Agent, and Experimental Biological Technician. Instruct the class to write in less than five sentences how these workers in fishery environmental protection help the economy of our county.

4-G EVALUATION ACTIVITY: (Test for Goal and Objective 4)
Given the COULD prepared worksheet entitled Catch As Much of Anything As You Like, the learners will list how a restriction-free fishery would effect each of the workers listed on the worksheet.

NAME_____

CATCH AS MUCH OF ANYTHING AS YOU LIKE

INSTRUCTIONS: Read the explanation and the lists of occupation titles below. Then list how the rule "catch as much of anything as you like" would affect that worker.

The fishery industry in Coos County adds more than $10 million to the economy each year. But for a moment, lets pretend that anyone who wanted to fish could catch as much of anything as they liked.

How would this affect the fishery resources?

And, equally important, how would this affect the workers in the fishing industry this year and in the years to come?

Captain

Deck Hand

Sales Clerk (Fishing supply store)

Stock Boy (Fishing supply store)

Carpenter

Electrician

Laborer (Boat building yard)

Laborer (Oyster farm)

Machinist

Oyster Planter

Painter

Pipe fitter

Purchasing agent (Shipyard)

Secretary bookkeeper

Stringer (Oyster farm)

Welder

Backer

Canner

Cooker

Dock Worker

Filleter

Floor Lady

Graders

Packagers

Pickers

Shuckers

Fish cutter

Manager-Assistant Manager

Truck driver

Wholesale Market owner

Retail Market owner

Reread all that you have written above. In general, what would be the main effect on all the workers in the fishing industry if anyone could catch as much of any fish as they wanted?

COULD PREPARED MATERIALS

	Activity No.
16mm SOUND FILMS:	
Protecting Aquatic Life: The Environmental Biologist	1-I, 1-J, 1-Q 1-R, 1-T, 1-U
Coos County Fisheries: An Overview	4-A, 4-B
PAMPHLETS:	
Oregon Fish Commission: Shrimp and Groundfish Investigation	1-I, 1-J, 1-R
More Jobs of the Aquatic Biologist	1-I, 1-J, 1-R 1-T
The Work of the Marine Extension Agent	1-I, 1-J, 1-R 1-V, 1-W
Protecting Our Valuable Estuaries	1-Q, 1-R
Audio Tapes:	
What Would You Do?	1-B, 1-C, 1-I 1-J, 1-R
Transparency:	
Occupational Descriptive Sheet	3-D, 3-E

RESOURCES

COMMERCIALLY PREPARED MATERIALS

		Activity No.
16mm SOUND FILMS:		
Still Waters	IED No. F1163	1-L, 1-N, 1-O 1-P
PRINTED MATERIALS:		
Crisis in Oregon Estuaries: A Summary of Environmental Factors Oregon Estuaries		1-L, 1-Q, 1-R 1-S, 2-B, 3-A
OSU Marine Advisory Program, Corvallis, 1970		

RESOURCE SPEAKERS

The following people have consented to act as resource people. They should be contacted at least one week to a month in advance of their visit, to give them time to prepare for their presentation and gather materials needed.*

NAME	OCCUPATION	PHONE NO.
Bruce Mate	Marine Extension Agent	267-7009
Bob Mullen	Aquatic Biologist: Oregon Fish Commission	888-3771
Bill Barss	Aquatic Biologist: Oregon Fish Commission	888-3771

*Some parents of children in your classroom may be able to serve you as resource speakers. If this is the case, they should be contacted.

RESOURCE OUTLINE: MARINE EXTENSION AGENT

DATE OF VISIT:_____

TIME OF VISIT:_____

SCHOOL AND ADDRESS:_____

SCHOOL PHONE:_____

TEACHER:_____

TEACHER'S HOME PHONE:_____

The children would like to hear about any information and background information that you might have on the following topics:

Impact of Foreign Fishing Fleets on the Fishery

The 12 Mile Limit

It would be helpful if you would tell the children about these problems but not their solution as you see it. Please tell them only about the effects of these two inter-relating problems.

After your presentation, the class will be broken into small groups and be given the task of proposing solutions to these problems as they see applicable. If you wish to stay and move about talking to the groups and asking questions about the feasibility of their solutions as they discuss them, please feel free to do so.

RESOURCE OUTLINE: AQUATIC BIOLOGIST: SHRIMP AND GROUNDFISH INVESTIGATION

DATE OF VISIT: _____

TIME OF VISIT: _____

SCHOOL AND ADDRESS: _____

SCHOOL PHONE: _____

TEACHER: _____

TEACHER'S HOME PHONE: _____

A. If at all possible, the resource person should bring as much equipment used on the job as he is able. The children will learn more about the equipment used and the job if they can see the tools. Examples of things you might bring to class would be any special clothing, some shrimp, a fish tag, a log book, and some scale samples. Any pictures or films that you have showing your work could be shown at the time of the visit if you wish.

B. Points to discuss:
1. Why did you go to work for the Oregon Fish Commission?
2. What job did you hold before this one?
3. What are the minimum qualifications for your job: physical and educational?
4. What do you like most about your job?
5. What do you like least about your job?
6. What are the working conditions?
7. What are the working hours? Is the work full time?
8. What are your wages?
9. Does your job in any way affect the environment?
10. Are there any dangers in the work that you do?
11. Can you describe your job in detail?

C. Vocabulary words to cover with the class or group:

1. Groundfish market sample	9. biomass
2. log research	10. fishery
3. resource survey	11. overfish or fish out
4. shrimp ground survey	12. landing restrictions
5. tagging fish	13. log information
6. random sample	14. fish tag
7. species	15. record sheet
8. trend	16. scale sample

RESOURCE OUTLINE: MANAGEMENT BIOLOGIST: ESTUARY MANAGEMENT AND SHAD AND STRIPED BASS RESEARCH

DATE OF VISIT: _____

TIME OF VISIT: _____

SCHOOL AND ADDRESS: _____

SCHOOL PHONE: _____

TEACHER: _____

TEACHER'S HOME PHONE: _____

A. The resource person should bring as much of the equipment used on the job as possible. The children will learn more about the equipment used and the job if they can see the tools. If the children could see things such as a scale sample, fish tag, a seine, gill nets, a sample of shad or striped bass, it would help them better visualize your work. Any pictures or films that you have showing your work could be shown at the time of the visit if you wish.

B. Points to discuss:
   1. Why did you go to work for the Oregon Fish Commission?
   2. What job did you hold before this one?
   3. What are the minimum qualifications for your job: physical and educational?
   4. What do you like most about your job?
   5. What do you like least about your job?
   6. What are the working conditions?
   7. What are the working hours? Is the work full time?
   8. What are the wages?
   9. Does your job in any way affect the environment?
   10. Are there any dangers in the work that you do?
   11. Can you describe your job in detail?

C. Vocabulary words to cover with the class or group:
   1. scale sample
   2. fish tag
   3. estuary
   4. spawn
   5. spawning grounds
   6. seine
   7. seining
   8. gill net
   9. buffer strip
   10. record sheet
   11. dorsal fin
   12. migration
   13. shad and striped bass research

RESOURCE OUTLINE: AQUATIC BIOLOGIST: COASTAL RIVERS RESEARCH

DATE OF VISIT: _____

TIME OF VISIT: _____

SCHOOL AND ADDRESS: _____

SCHOOL PHONE: _____

TEACHER: _____

TEACHER'S HOME PHONE: _____

A. The resource person should bring as much of the equipment used on the job as possible. The children will learn more about the equipment used and the job if they can see the tools. Examples of things that you might bring would be a lake trap, a gill net, record sheets, and a scale sample. Any pictures or films that you have showing your work could be shown at the time of the visit if you wish.

B. Points to discuss:
   1. Why did you go to work for the Oregon Fish Commission?
   2. What job did you hold before this one?
   3. What are the minimum qualifications for your job: physical and educational?
   4. What do you like most about your job?
   5. What do you like least about your job?
   6. What are the working conditions?
   7. What are the working hours? Is the work full time?
   8. What are the wages?
   9. Does your job in any way affect the environment?
   10. Are there any dangers in the work that you do?
   11. Can you describe your job in full?

C. Vocabulary words to cover with the class or group:
   1. gill net
   2. lake trap
   3. spawning count
   4. fishery
   5. limnology
   6. scale sample
   7. species
   8. Coho
   9. record sheets
   10. competition
   11. spawning grounds
   12. spawn
   13. B.O.D. or biological oxygen demand
   14. tributaries

RESOURCE OUTLINE: MARINE EXTENSION AGENT

DATE OF VISIT: _____

TIME OF VISIT: _____

SCHOOL AND ADDRESS _____

SCHOOL PHONE: _____

TEACHER: _____

TEACHER'S HOME PHONE: _____

A. The resource person should bring as much of the equipment used on the job as possible. The children will learn more about the equipment used and the job if they can see the tools. Samples of the reports that you write, any studies that have been done on the ecology of this area and samples of the different projects that you have worked on would prove interesting to the children. Any pictures or films that you have showing your work could be shown at the time of the visit if you wish.

B. Points to discuss:
   1. Why did you go to work for the Oregon Fish Commission?
   2. What job did you hold before this one?
   3. What are the minimum qualifications for your job: physical and educational?
   4. What do you like most about your job?
   5. What do you like least about your job?
   6. What are the working conditions?
   7. What are the working hours? Is the work full time?
   8. What are the wages?
   9. Does your job in any way affect the environment?
   10. Are there any dangers in the work that you do?
   11. Can you describe your job in detail?

C. Vocabulary words to cover with the class or group:
   1. dissemination
   2. land fill
   3. marine extension

People in Coos County employed for the purpose of protecting the ecology of our fisheries are few in number when compared to the number of people involved in the fishing industry. But without their work and the work of others like them at the state level, the $10 million plus a year industry would soon face economic disaster.

The main agency which deals with problems of fishery management is the Oregon Fish Commission. Their job is to insure an optimum yield of seafood products from the sea, bays, and rivers without allowing any species of marine life to become extinct from overfishing. To do this, they have several divisions within the Commission itself; Shrimp and Groundfish Investigation, Estuary Management, Shad and Striped Bass Research, and coastal Rivers Research Divisions. All four divisions require basic research to determine the biomass or estimated amount of fish by weight living in different bodies of water. To gather this information, samples may be made at the commercial fisheries, locations picked at random in lakes and streams or aboard commercial fishing vessels at sea. From these samples and the statistics gathered, the Fish Commission can chart trends, forecasts and percentage estimates of sex, weight and age compositions of the biomass.

Along with these research activities, the biologists also tag fish to help determine migratory patterns and periodically check, by calculation, the percentage of the fish population being landed per year. These men may also sample lake populations for species and water quality. The one thing that sets these biologists apart is that most of the field samples taken are returned live to the water. But determining fish populations is not their only duty. If a fish population seems endangered, restrictions may be placed on that species for a period of time. These restrictions can come in the form of restricted commercial license issue, landing restrictions for actual poundage landed, net mesh standards, or season length regulations. All suggested restrictions to be placed on the industry are reviewed at the state or district level where recommendations of the local fishermen are also considered before any action is taken.

An important function performed by the Oregon Fish Commission is that of an advisory position. The Management Biologist works closely with the Corps of Engineers in researching possible effects of structures placed in estuaries of our county. The estuaries, comprising about 10,300 acres, form an important part of the food chain in our environment. Proposed structures such as pilings, docks and land fills could destroy a productive area which provides recreation for 120,000 clam diggers alone yearly, as well as an area which yields $500,000 worth of oysters and young fish passing through these areas. Another advisory function of the Management Biologist is to work closely with the local logging companies to produce a logging calendar and practices which will leave streams and spawning fish undisturbed.

Many people could become confused with the Oregon Fish and the Oregon Game Commission functions. Their jurisdiction overlaps as far as proposing restrictions of the fishery on the same species of fish. The difference is that the Oregon Game Commission deals only with sport fisheries and fishermen, while the Oregon Fish Commission is commercially oriented.

Into this field of management steps a man whose job is only partly related to ecology but whom the fishermen feel is very important--the Marine Extension Agent. His job, in part, consists of educating the fishermen on proposed restrictions and how to go about making themselves heard before a decision is made. He also functions as a disseminator of information of importance to the commercial fishing industry such as ecological reports, industrial pollution studies, etc. His function is to make people aware of the problems and their possible effects and to educate them in the proper methods of going about finding solutions or urging that others solve these problems. He works closely with the fishermen, the Oregon Fish Commission and anyone interested in the environment in which we live.

On the following pages can be found a list of suggested teacher reading, job explanations and detailed job descriptions. This information is not meant to be given to the learners but is simply included as an attempt to provide you with a broader background for presenting this unit.

Suggested Teacher Reading

Background on Oregon's Marine Industry, Extension Circular 750, Cooperative Extension Service, O.S.U., Corvallis, 1970.

Crisis In Oregon Estuaries, O.S.U. Marine Advisory Program, O.S.U., Corvallis, 1970

AQUATIC BIOLOGIST: JOB DESCRIPTION

Groundfish Market Sampling

1. When the commercial fishing boats bring in a load of fish to the fishery, the worker will remove about 200 fish at random from the catch.
2. He will separate them into piles of different species.
3. He counts and records the number of each species.
4. He may also sort one or more of these piles according to sex, age, and/or weight and record this information. He may weigh several piles of the fish.
5. The statistics gathered from this sampling will help the worker make estimates of the approximate weight of each species that makes up the load and the different species in the catch.
6. This information is sent to headquarters and is used to make up trend charts for the different species showing what fish are being caught most frequently, their sex, size and weight. Landings of a certain fish may be up at one season this year but down the next. These figures help the worker know which species are being overfished or are having problems with reproduction.
7. If the figures show a species is being overfished, landing restrictions may be placed on that species. From information such as this has come restrictions requiring a specific size mesh for the otter and shrimp trawl nets which would allow the smaller fish and shrimp to escape and have a chance to grow and mature.

Log Research

1. Log information is collected from the commercial fishing boat log books. These log books tell where the majority of the catch was made (the general area and depth fished).
2. From these facts and the market sampling information that is gathered, the worker can determine where discrete populations lie. If one area is being overfished, a restriction may be placed on fishing for that species of fish in a particular area.

Resource Survey

1. A research vessel is chartered each year and taken to sea. About 100 test areas are fished for brief periods of time.
2. The fish caught are sampled for species composition, sex, growth, weight of individual fish, as well as the weight of the catch for that species.
3. This information is recorded and used to estimate the biomass of different species up and down the coast.

Shrimp Ground Survey

1. The worker will charter a boat and go out to the known shrimp grounds. They will make 15-30 tows in these areas.
2. The shrimp caught are sampled for different weights of the catches, shrimp age, sex, and growth.

4. If these shrimp grounds are being fished out, a restriction may be placed on the amount of shrimp that may be taken from that area or the size of the net mesh that is being used.

Tagging Fish

1. The worker may go out as the guest of a commercial fishing vessel and take samples of the catch. He will tag these fish, take scale samples, and may weigh the fish.
2. He will record all this information on record sheets and return the fish to the water.
3. If the fish is caught by fishermen in the future, it will be brought to the field lab and a scale sample will be taken again and compared with the previous record for the fish tagged with that number.
4. This helps the worker compare the actual growth of the fish to the criteria used to tell scale (fish) age of tagged fish: i.e., the actual growth of the fish the same as that determined by the scale samples taken.

Coastal Rivers Research

1. The worker will take a boat to the lake and let out the gill net in several places to determine where the concentrations of coho are found in the lake. He throws back all of the fish that he catches. He may take samples of the contents of the fishes' stomachs. He cuts the stomach of certain selected coho and removes the contents. He will take this content sample back to the lab for analysis.
2. Where there is a concentration of coho, he will set up a lake trap (a type of live fish trap used at the lakes to catch the fish alive).
3. The worker will be back to the trap periodically and pull it up to check the samples of fish caught.
4. He records the number of coho, number of other fish and may take their weight and record it.
5. From this information he can get some idea of the number of coho in the lake, what they are eating, and how much they are possibly competing with the other fish in the lakes for food. Since these salmon must live in the lakes until they have grown enough to shoot to the ocean, this information helps the worker get an idea of the number of fish that will come from that lake and their growth rate.
6. The information is also used to analyze and determine if any remedial action is necessary to maintain optimum levels of coho production.
7. During the winter months when the adults come back to the tributaries to spawn, the worker goes out to the spawning grounds and makes a count of the spawning fish.
8. This information is recorded and helps determine the abundance and sexes of adult fish from year to year.
9. The worker may take samples of the lake water at different times of the year and make chemical tests on it. One of the tests is for oxygen content of the water. The amount of oxygen in the water will

partly determine the number of fish that the water can support.

10. In cases of reported pollution the worker may collect samples of water and send them in or make tests for B.O.D. (biological oxygen demand) at the lab.

MANAGEMENT BIOLOGIST: JOB EXPLANATION

Shad and Striped Bass Research

1. The worker takes market samples of the catch and records the weight of the fish in each catch.
2. He takes scale samples from the fish to determine the age of the sample and whether the fish are being overfished. When examined the worker can tell how old the fish is. This information helps the worker determine if the species is being overfished or not. If the scales show these are young fish (over a period of several years) it will indicate that possibly the population is being overfished and landing restrictions should be placed on the industry. If the scales show an older more mature catch, the population is not being overfished.

Fishery Environment Management

1. The worker gets a copy of all applications made to the Corps of Engineers for placing structures in the estuaries and water ways of the county.
2. He then goes out to that area and tries to determine what effect, if any, could be caused by the proposed structure to the fishery resource in the river or bay.
3. He may take samples by seine, or gill net of the fish using that area, or may sample the life living in the tidelands or mud flats by digging up selected areas for samples of clams, shrimp and worms that live in the mud.
4. He will record the number and type of marine life in that area.
5. If the area provides food and/or homes for fish and shellfish or is feeding ground for the fish and it is determined that dredging or pilings placed in that area would destroy the balance of marine life, he may write up a recommendation that the permit not be granted. The recommendation is then sent to the Corps of Engineers who review the recommendation before taking any action.
6. He may have to testify at hearings called to discuss granting of the permits. He uses data gathered from this research to estimate the number and type of fish in an area and explains how the proposed structure would affect the marine life.
7. About once a year, he will meet with the management people from the different logging companies and go over their logging plans for the coming year. They will cover the time of year each area is to be logged.
8. If logging is to be done across what is considered a valuable stream, in the fishery, the management biologist may request that the area be logged at a certain time of year so that spawning fish are not killed.
9. He may suggest that a buffer strip of trees be left along the stream to protect the spawning grounds and the marine life in the stream.

River Survey

1. The worker will use a boat and a seine net at selected stations on the river. He will attach the one end of the net to the shoreline and take the boat out toward the middle of the river, laying out the net as he goes. He then sweeps the boat back to the shore gradually closing off the seine.
2. On the shore he will pull in the seine and remove the fish caught from the net. He will count the different species of fish and record this information on a record sheet. This type of survey helps the worker determine the species of fish that use that waterway and the quantity of each species.

Tagging Striped Bass

1. The worker goes out as a guest of a commercial bass fisherman on a commercial fishing boat. He samples the fish caught in the gill net by removing the fish from the net, checking its sex and possibly taking a scale sample.
2. He then places a tag in the fish by inserting the needle of the tag through the back of the bass just at the base of the dorsal fin. He ties the tag around the fish, records the number of the tag with the previously gathered information, and places the fish back in the water.
3. When a commercial or sport fisherman catches the fish, he will read the address of the Fish Commission and return the tag to that lab. The worker reads the number from the tag and looks up the records for that number fish.
4. From this information, the worker can make an estimate of how many fish are living in the river and their migration patterns. If the fish are being overfished, a restriction may have to be made on that species in that particular river.

MARINE EXTENSION AGENT: JOB DESCRIPTION

1. The worker may read reports written on the local environment by the Department of Environmental Quality, the Oregon Fish Commission, the Oregon Game Commission, The University of Oregon Marine Biology Institute, and rewrite these reports into a form which the layman can understand.
2. He may take pictures to go along with the report. The rewritten report with the pictures is then copied and distributed to interested groups around the county and to fishermen.
3. He may also take slides or movies to show a local TV show telling about environmental problems the average person should be aware of.
4. He gives talks to local groups and individual fishermen emphasizing environmental problems and what can be done to solve them (how people can and should become involved.).
5. He may gather reports and recommendations made by the Oregon Fish Commission and other agencies and disseminate this information to the fishermen by individual contacts or by group meetings. He will present the reports and recommendations, help the fishermen organize their feelings and thoughts about these reports and help them get this information to higher authorities so that local fishermen can have a voice in making restrictions and regulations on the fishing industry of Coos County.
6. He may meet with port of planning commissioners to give advice on estuary use and land fill. He will present information to these groups from studies made on the possible environmental effects on the fishery of a land fill or a certain type of land use.
7. He works with local fishermen to help them clarify their thoughts and feelings on the impact of the foreign fishing fleets on the local fishery. Then he helps them present their thoughts to the proper decision-making bodies of the government.
8. He may write or provide local news media with information about environmental problems and what the effect could be so that more people will be aware and concerned (possibly to the point of demanding action from the government).

MARINE EXTENSION AGENT

OCCUPATIONAL DESCRIPTION

This worker's job, in part, is to act as an educator and disseminator of information which will directly affect the commercial fishing industry in our county. He collects and helps interpret information from various regulatory agencies of the state and federal government and disseminates this information to the commercial fishermen and other interested groups and individuals in the county. He may write or provide the news media with information about problems and what their effects are or might be on the environment so that people will become aware and concerned. This would also include talks and movie or slide shows to any interested groups and individuals. He instructs and helps the fishermen in clarifying their thoughts on any proposed restrictions on the fishing industry such as season closure, season shortening or license restrictions, and helps them channel their feedback to the proper authority so that they can have a voice in environmental control.

EQUIPMENT

Reports and information on environmental quality, information from different agencies affecting the fishing industry, and sometimes a camera.

MINIMUM QUALIFICATIONS

Education: Bachelor of Science degree in Marine Biology and fields related to the commercial fishing industry.
Training: Will get on the job training in the methods to be used.

PHYSICAL DEMANDS AND WORKING CONDITIONS

Aptitudes: Must possess average aptitudes in motor coordination and manual dexterity. Must enjoy working with groups and individuals to help solve their problems and help them channel their feelings to the proper authorities.
Temperament: Must be able to work with people and arbitrate problems with groups. Must be willing to help any of the fishermen who request help and be able to refer them to someone else if he cannot help.

CHANCES FOR PROMOTION

Could be promoted to a position in the state level government.

AQUATIC BIOLOGIST

OCCUPATIONAL DESCRIPTION

The worker participates in research of various types to determine the number of and types of species in the ocean at a given time. To do this, he may take market samples, gather log information, participate in a resource survey or shrimp ground survey, tag fish, or participate in the coastal rivers research program or striped bass and shad research. From the statistics gathered through this research, the worker can estimate the weight of a certain species of fish in the ocean or lake, the species composition, the percentage of sex, growth rate, and the amount of fish that are being removed from a certain area. This information is then forwarded to the decision-making body of government with recommendations for any restrictions to be placed on the industry.

EQUIPMENT

Boots, rain gear, gill nets, fishing gear appropriate to the type of research being done, lake traps, fish tags, and record sheets.

MINIMUM QUALIFICATIONS

Education: A Bachelor of Science degree in fisheries or a related field.
Training: Will get on the job training in the research techniques used at that field lab.

PHYSICAL DEMANDS AND WORKING CONDITIONS

The work is done both indoors and out in the weather under both quiet and fairly noisy conditions. The worker is subject to the hazards of working on a vessel at sea when doing research on a charter or commercial fishing boat. He should possess average physical strength and endurance to move equipment and fish around during the research.

WORKER CHARACTERISTICS

Aptitudes: Must have above average aptitude in math and statistical interpretation. Must possess average aptitude in manual dexterity and motor coordination.
Temperament: Must be able to work well with the commercial fishermen on their boats gathering information. Must be able to work well without direct supervision.

CHANCES FOR PROMOTION

Will get a pay raise as the years of experience permit. Could be promoted to Project Leader if there is an opening in that area and the applicant has the experience necessary.

MANAGEMENT BIOLOGIST
(Aquatic Biologist II)

OCCUPATIONAL DESCRIPTION

Receives applications for placing structures in the estuaries, rivers, and bays from the Corps of Engineers. Goes to the location and surveys the possible effect the structure would have on the total fish life in the bay, river or tideland. He may seine an area of the water to determine what fish are living in the tidelands. He will record the number, species, and sex, and age of the fish and write up a report telling the Corps whether or not he feels this structure will harm the existing fish population using that particular water way. He is involved in the Shad and Striped Bass Research. This involves a market sampling of the landings made at the fishery. He samples the fish and examines them for sex, measures their length and takes a scale sample. From this information he can determine whether or not the particular species is being overfished. Every year he will go over the advanced logging plan with the different companies in the county. He will make recommendations as to which streams should have a buffer strip left along their banks so as not to disturb the fish population in that stream. He may recommend that a certain area not be logged until a specific time of year so that the fish life in the river can spawn undisturbed.

EQUIPMENT

Clam shovel, pails, samples, seine net, record sheets, rain gear and boots, boat and other fishing gear necessary for sampling the water ways being researched.

MINIMUM QUALIFICATIONS

Education: A Bachelor of Science in Fisheries or a related field.
Training: Will get on the job training in the methods used at that field lab.

PHYSICAL DEMANDS AND WORKING CONDITIONS

The work is done mostly out of doors in the weather, but is also done inside. The worker works under fairly noisy conditions some of the time when working on boats and around the fishery equipment, but in general works in a fairly quiet surrounding. He is subject to hazards of working on boats on the water and needs above average physical strength and endurance to let out the seine net and bring it back in, walk through the tideland mud and walk into areas where proposed structures are to be built to make his survey.

WORKER CHARACTERISTICS

Aptitudes: Must have above average aptitude in math, motor coordination and manual dexterity.
Temperament: Should be able to work well without direct supervision and work accurately considering the interest of the environment and the people involved.

CHANCES FOR PROMOTION

Will be promoted and get a pay raise concurrent with his increased experience. His next position would be Aquatic Biologist III.

EXPERIMENTAL BIOLOGICAL TECHNICIAN

OCCUPATIONAL DESCRIPTION

This man helps the other Aquatic Biologists in their work. He may be in charge of preparing any fishing equipment, nets, lines, etc. to be used in the survey. He is also in charge of repairing any of the equipment as necessary. He will do the spawning fish surveys and record any information necessary when working with the Aquatic Biologists such as information from market sampling, shrimp and groundfish surveys, etc.

EQUIPMENT

Nets, boat, rain gear, record sheets, and other fishing gear.

MINIMUM QUALIFICATIONS

Education: Must possess a Bachelor of Science in fisheries or a related study.
Training: Will get on the job training in the methods used at the field lab.

PHYSICAL DEMANDS AND WORKING CONDITIONS

The work is done mostly outdoors in the weather under fairly noisy conditions when working around the fishing boats and fishery equipment. The worker needs above average physical strength and endurance to move fishing equipment and make any necessary repairs.

WORKER CHARACTERISTICS

Aptitudes: Must possess average aptitudes in motor coordination and manual dexterity as well as math.
Temperament: Must be able to work well with other people as well as without direct supervision.

CHANCES FOR PROMOTION

If his educational background meets the requirements for Aquatic Biologist, he could be promoted to that position if the opening occurred.